

**DESCRIPTION OF MATURE LARVA OF
OSMIA (ACANTHOSMIOIDES) NIGROBARBATA
(HYMENOPTERA: MEGACHILIDAE)¹**

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ABSTRACT: The mature larva of *Osmia (Acanthosmioides) nigrobarbata* is described and compared with the other described larvae in the genus. The antennal papillae and the maxillary and labial palpi are the fundamental morphological features which permit the characterisation of the species studied.

The holarctic genus *Osmia* Panzer comprises about 135 species in the Nearctic region, distributed from the Boreal zone to Costa Rica (Michener *et al.*, 1994). Nests are in preformed cavities or burrows in stems, wood or soil.

To date, the mature larvae of only four species have been described (McGinley, 1989) of which three are Palearctic and one Nearctic with two subspecies.

The larva here described is, therefore, the second known for a Nearctic species, and the first for its subgenus.

MATERIALS AND METHODS

A postdefecating larva preserved in alcohol, collected in 1966 by Rozen and Favreau in Arizona (3 miles north of Apache, Cochise County) U.S.A., has been studied.

The techniques employed for its treatment were those described by Michener (1953) and McGinley (1981), consisting of drawing the intact specimen with the aid of a camera lucida. The head capsule and the tegument were then cleared with a solution of hot potassium hydroxide (KOH), neutralising the caustic base in water and placing it in a well slide filled with glycerine.

The terminology used is that of Michener (1953) and Rozen (1994), and the following abbreviations are used in the description: d = diameter; h = height; l = length; w = width; m = mean.

***Osmia (Acanthosmioides) nigrobarbata*, Cockerell**

Mature larva

Figures 1-10

BODY: Robust fusiform (l = 10mm; w at widest = 3.75mm), with greatest width at IV

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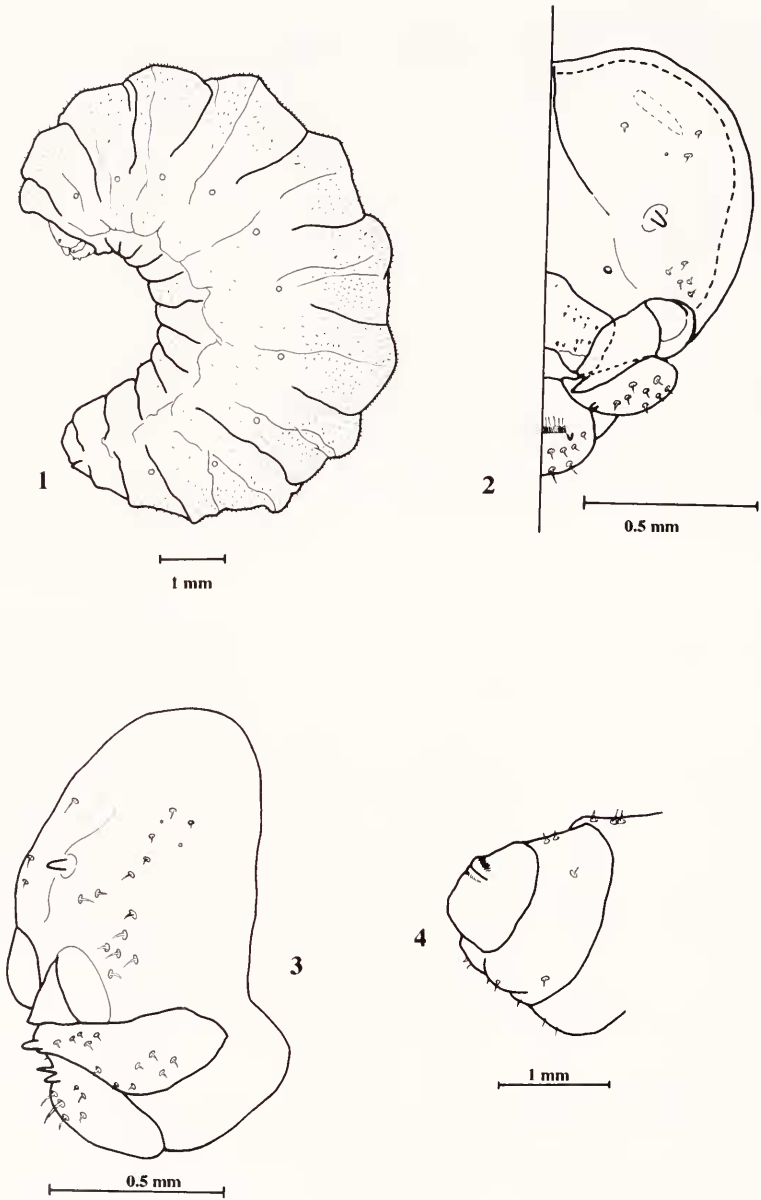
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abdominal segment (Fig. 1). Color yellowish-white. Thoracic segments with large dorsal folds which cover head. Intersegmental lines well marked on dorsal and ventral zones, disappearing in pleural areas. Conspicuous dorsal intrasegmental lines, dividing segments into cephalic and caudal annulets. Dorsal tubercles present, expanded and relatively little elevated (Fig. 1); ventrolateral bulging present. Integument slightly sclerotized, with long setae distributed principally on dorsal region of intermediate segments; setae more scarce on thoracic segments and abdominal segments IX and X as on ventral region. Abdominal segment X centered on IX. Anus transverse and dorsoapical, with two labia bordering it (Fig. 4). Perianal area setae on ventral zone of anus, very small, in immediate vicinity of anus and increasing with distance from it. Integument below anus with parallel striae, above anus smooth. Spiracles globular ($h = 0.058-0.062\text{mm}$, $m = 0.060\text{mm}$; $w = 0.079-0.082\text{mm}$, $m = 0.080\text{mm}$), slightly raised above surface, atrial walls ringed externally and internally (Fig. 7). Internal walls with large number of short thick spines. Neither tubercles nor sclerites observed. Peritreme wide ($w = 0.015-0.017\text{mm}$, $m = 0.016\text{mm}$), occupying 2/5 of total width of stigmatic orifice. Subatrium with 9 rings of smooth walls.

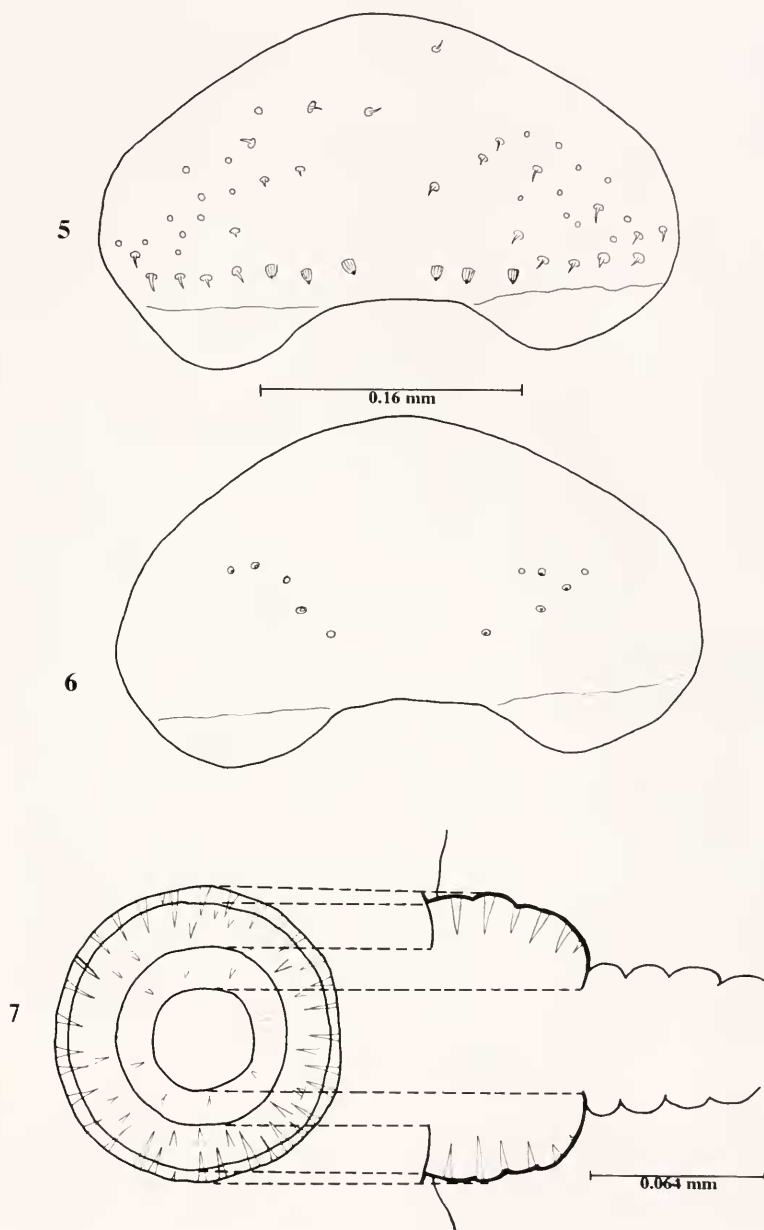
HEAD: Head capsule small in relation to body ($l = 0.70\text{mm}$; $w = 1.19\text{mm}$), sclerotized; mandibular apices, tentorium, lateral zones of labrum and antennal palpi remarkable for their dark pigmentation. Scarce and dispersed setae located in greater numbers and of greater size on pleurostomal zones (Fig. 4); setae relatively abundant but smaller on frontoclypeal region. Placoid sensilla in lesser numbers than setae and dispersed over whole surface of head capsule. Tentorium well developed, anterior and posterior tentorial arms clearly distinguishable. Anterior tentorial pits situated in a position similar to other species in family, posterior tentorial pits located behind mandibular bases. Parietal bands short and little marked. Antennal disk moderate in size ($d = 0.060\text{mm}$), on small prominence. Antennal papilla little less than twice as long as wide ($l = 0.048\text{mm}$; $w = 0.029\text{mm}$), narrowing toward apex, on which three small sensilla can be distinguished.

Vertex uniformly rounded (Fig. 3), without tubercles or projections. Postoccipital ridge well marked and visible. Frontoclypeal area smooth and without special features, except for small setae and sensilla previously mentioned. Frontoclypeal suture not evident and clypeus only marked by an arc formed by six setae on its apical third. In lateral view, labrum weakly projected toward the exterior; presenting a series of setiform and placoid sensilla, irregularly dispersed over whole surface. Six dome-shaped sensilla distinguishable (3+3) on apical margin (Fig. 5). Labral tubercles absent. Margin of labrum straight with large rounded prominences on both sides (Fig. 5). Epipharynx with two groups of sensilla (6+5) on mediolateral zones (Fig. 6); rest of surface smooth.

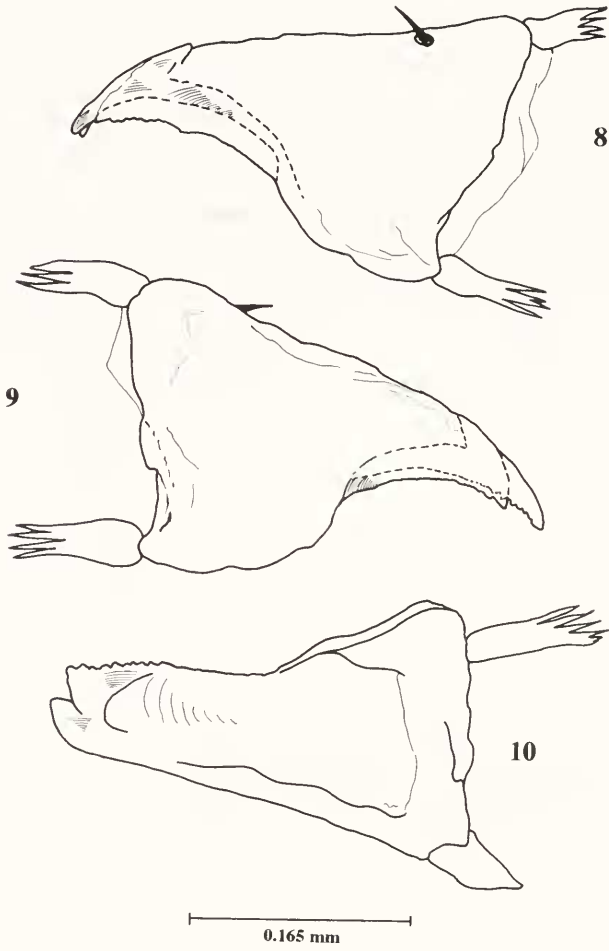
Mandibles (do not meet at the midline) bidentate (Figs. 9, 10) with teeth unequal (ventral slightly larger); inner concavity well defined (Fig. 10); cusp inconspicuous; edges smooth except for upper border of dorsal tooth, serrated at apical end with small denticles (Figs. 8, 10). Strong seta on external surface near mandibular base. Labiomaxillary region slightly projected forward in lateral view (Fig. 3). No evident fusion between maxillae and labium. Maxilla weakly sclerotized; strong setae on its external surface, fundamentally behind maxillary palpi. Small group of setae of lesser size in front of maxillary palpi (Fig. 2). Galeae absent. Maxillary palpus situated on apical third of external surface; subapical in lateral view; a little less than twice as long as wide ($l = 0.032\text{mm}$; $w = 0.019\text{mm}$), narrowing toward apex. Two small sensilla at apex. Labium with evident prementum and postmentum; slightly sclerotized except for salivary lips; in dorsal view, triangular in form with vertices rounded. Labial palpi situated below salivary lips and a little separated from their ends; smaller than antennae and similar to maxillary palpi ($l = 0.029\text{mm}$; $w = 0.019\text{mm}$), with two small sensilla in their apices. Two groups of setae in zones adjacent to labial palpi directed toward lower zone and increasing size farther from palpi. Salivary lips project strongly in lateral view, occupying a width of approximately half that of prementum. Hypopharynx smooth and without differentiations.



Figs. 1-4.- *Osmia nigrobarbata*, mature larva; 1, lateral view; 2, frontal view of head; 3, lateral view of head; 4, anal opening and IX-X abdominal segments.



Figs. 5-7.- *Osmia nigrobarbata*, mature larva; 5, frontal view of labrum; 6, frontal view of epipharynx; 7, spiracle.



Figs. 8-10.- *Osmia nigrobarbata*, mature larva; 8, dorsal view of right mandible; 9, ventral view of right mandible; 10, inner view of right mandible.

DISCUSSION

The family Megachilidae is very homogeneous in its larval characters (Michener, 1953; Rozen, 1973), an aspect which seems to be confirmed within the genus *Osmia*, including the larva described here. Nevertheless, certain characteristics of the larva studied allow us to separate it from those of *Osmia* previously described, despite the limitations imposed by the study of a single specimen.

Dorsally developed thoracic segments, similar to those of the larva studied, are only found in *Osmia aurulenta*, where they also hide the head capsule (Marechal, 1926). In the same way, the presence of ventrolateral bulges, which can be considered as tubercles, only exist in *O. nigrobarbata* and *O. aurulenta* (Marechal, 1926; Michener, 1953), although the latter is differentiated by the presence of dorsally elevated caudal annulets (Michener, 1953), and also by the different distribution of the setae on the tegument (Marechal, 1926). *O. nigrobarbata* and *O. lignaria*, in contrast to the rest of the known species, have the antennal disk on a small elevation (Michener, 1953) and in *O. lignaria lignaria* a serration in the mandibular teeth can be observed (Baker *et al.*, 1985). However, the proportion of width/length of the antennal papilla – greater in *O. lignaria* – and of the maxillary palpus – lesser in *O. lignaria* – similar to the slightly evident inner concavity in *O. lignaria* (Michener, 1953) allows the differentiation between both species.

Of all the previously described species, only in *O. submicans* is the presence of an apical row of papilla (Michener, 1953) or eight sensorial lamina on a strongly pointed labrum (Maneval, 1939) mentioned. That could be interpreted as similar to the dome-shaped sensilla described for *O. nigrobarbata*, although in no case are placoid or setiform sensilla mentioned, and these are noted for other genera of the family (Grandi, 1935). Further, no reference has been made, up to now, to the existence of sensilla on the epipharynx and on the head capsule (placoid sensilla). The fundamental differences between the larvae of *O. nigrobarbata* and *O. submicans* are in the distinct width/length proportion of the antennal papilla, and of the maxillary palpus, greater in both cases in *O. submicans* (Michener, 1953). Five sensilla at end of the maxillary palpus of *O. submicans* (Maneval, 1939) contrast to the three present in the species studied here. They are also differentiated by the morphology of the salivary lips, unusually long in *O. submicans* (Michener, 1953).

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LITERATURE CITED

- Baker, J.R., E.D. Kuhn & S.B. Bambara**, 1985.- Nests and Immature Stages of Leafcutter Bees (Hymenoptera: Megachilidae). Jour. Kans. Entomol. Soc., 58(2): 290-313.
- Grandi, G.**, 1935.- Contributi alla conoscenza degli imenotteri aculeati. XV. Bolletino dell'Istituto di Entomologia della Università di Bologna, 8: 27-121.
- Maneval, H.**, 1939.- Notes sur les hyménoptères (6e. série). Ann. Soc. Entomol. Fr., 108: 49-108.
- Marechal, P.**, 1926.- Étude biologique de l'*Osmia aurulenta* Panz. Bulletin Biologique de la France et de la Belgique, 60: 561-592.
- McGinley, R.J.**, 1981.- Systematics of the Colletidae Based on Mature Larvae with Phenetic Analysis of Apoid Larvae (Hymenoptera: Apoidea). Univ. Calif. Publ. Entomol., 91: 1-307.
- McGinley, R.J.**, 1989.- A Catalog and Review of Immature Apoidea (Hymenoptera). Smithsonian Contrib. Zool., 494: 24 pp.
- Michener, C.D.**, 1953.- Comparative Morphological and Systematic Studies of Bee Larvae With a Key to the Families of Hymenopterous Larvae. Univ. Kans. Sc. Bull., 35(8): 987-1102.
- Michener, C.D., R.J. McGinley & B.N. Danforth**, 1994.- The Bee Genera of North and Central America (Hymenoptera: Apoidea). Smithsonian Institution Press. Washington D.C. x+209 pages.
- Rozen, J.G. jr.**, 1973.- Immature Stages of Lithurgine Bees with Descriptions of the Megachilidae and Fideliidae Based on Mature Larvae (Hymenoptera, Apoidea). Amer. Mus. Novitates, 2527: 1-14.
- Rozen, J.G. jr.**, 1994.- Biology and Immature Stages of Some Cuckoo Bees Belonging to Brachynomadini, with Descriptions of Two New Species (Hymenoptera: Apidae: Nomadinae). Amer. Mus. Novitates, 3089: 1-23.